PANK2 gene

pantothenate kinase 2

Normal Function

The *PANK2* gene provides instructions for making an enzyme called pantothenate kinase 2. This enzyme is active in specialized cellular structures called mitochondria, which are the cell's energy-producing centers. Within mitochondria, pantothenate kinase 2 regulates the formation of a molecule called coenzyme A. Coenzyme A is found in all living cells, where it is essential for the body's production of energy from carbohydrates, fats, and some protein building blocks (amino acids).

PANK2 is one of four human genes that provide instructions for making versions of pantothenate kinase. The functions of these different versions probably vary among tissue types and parts of the cell. The version produced by the *PANK2* gene is active in cells throughout the body, including nerve cells in the brain.

Health Conditions Related to Genetic Changes

pantothenate kinase-associated neurodegeneration

About 100 mutations in the *PANK2* gene have been identified in people with pantothenate kinase-associated neurodegeneration. Typically, people with the more severe, early-onset form of the disorder have *PANK2* mutations that prevent cells from producing any functional pantothenate kinase 2. People affected by the atypical, later-onset form usually have mutations that change single amino acids in the enzyme, which makes the enzyme unstable or disrupts its activity. In some cases, single amino acid changes allow the enzyme to retain some function. The most common *PANK2* mutation replaces the amino acid glycine with the amino acid arginine at position 411 of the enzyme (written as Gly411Arg or G411R).

When pantothenate kinase 2 is altered or missing, the normal production of coenzyme A is disrupted and potentially harmful compounds can build up in the brain. This buildup leads to swelling, tissue damage, and an abnormal accumulation of iron in certain areas of the brain. Researchers are uncertain how a lack of functional pantothenate kinase 2 causes the specific features of pantothenate kinase-associated neurodegeneration. Because the enzyme functions in mitochondria, the signs and symptoms of this condition may be related to impaired energy production.

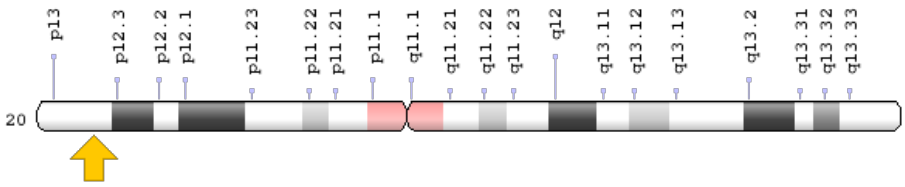
Mutations in the *PANK2* gene are also found in people with a condition called HARP (hypoprebetalipoproteinemia, acanthocytosis, retinitis pigmentosa, and pallidal degeneration). HARP was historically described as a separate syndrome but is now considered part of pantothenate kinase-associated neurodegeneration. Although

HARP is much rarer than classic pantothenate kinase-associated neurodegeneration, both conditions involve problems with movement, dementia, and vision abnormalities.

Chromosomal Location

Cytogenetic Location: 20p13, which is the short (p) arm of chromosome 20 at position 13

Molecular Location: base pairs 3,888,839 to 3,929,882 on chromosome 20 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- NBIA1
- PANK2_HUMAN
- pantothenate kinase 2 (Hallervorden-Spatz syndrome)
- pantothenic acid kinase

Additional Information & Resources

GeneReviews

- Pantothenate Kinase-Associated Neurodegeneration
  https://www.ncbi.nlm.nih.gov/books/NBK1490

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28PANK2%5BTIAB%5D%29+OR+%28pantothenate+kinase+2%5BTIAB%5D%29%29+OR+%28%28NBIA1%5BTIAB%5D%29+OR+%28pantothenic+acid+kinase%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

OMIM

- PANTOTHENATE KINASE 2
  http://omim.org/entry/606157

Research Resources

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=PANK2%5Bgene%5D
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=15894
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/80025
- UniProt
  http://www.uniprot.org/uniprot/Q9BZ23

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https://ghr.nlm.nih.gov/gene/PANK2

Reviewed: October 2006
Published: March 21, 2017

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